Installation Engineering Handbook 19
Western Electric
Kearny Works

Section
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# COUNTERCELLS

## (Semiconductor - Type)

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## 1. GENERAL

1.1 This section covers the general requirements for the KS-19200, KS-20019 and KS-20637 silicon-type countercells and for the KS-15928 selenium-type countercells.

1.2 In some plants one or more groups of countercells are connected between the battery and the load. These are arranged to be switched out of the circuit during an ac power failure to keep load voltage at the desired value.

1.3 These countercells have the property, when current flows through them of setting up a voltage opposing the voltage which is driving the current. The countercell voltage is substantially constant under wide variation of current.

## 2. SILICON-TYPE COUNTERCELLS

### 2.1 KS-19200 LI Countercell

2.11 The KS-19200 LI consist of three silicon diodes connected in series as a 1-3-1H half wave rectifier circuit. The silicon diode used is an IN-3289.

2.12 Table A shows the voltage drop at a various load current.

TABLE A

| LOAD CURRENTS | DC VOLTAGE DROP |
|---|---|
| 1.5a<br>3.75a<br>7.5a | 2.3V<br>2.4V<br>2.4V |
| 11.25a<br>15.00a (max.) | 2.5V<br>2.7V |

2.13 Positive voltage must be applied to the black terminal and negative voltage to the red terminal. (See Table D).

### 2.2 KS-20019 L1 and L2 Countercells

2.21 These consist of nine silicon diodes connected in series as 1-9-1H half wave rectifier circuit. The silicon diode used is an IN-3289.

2.22 The DC forward voltage is:

8.6V max at 40 amps
4.8V min at 1 amp

2.23 Positive voltage must be applied to the black terminal and negative voltage to the red terminal. (See Table D).

2.24 The KS-20019 L2 CEMF CELL'S Voltage drop is reduced by one ninth when the black and white terminals of the cell are used. For maximum voltage drop use the black and red terminals.

### 2.3 KS-20637 L1 and L2 Countercells

2.31 The KS-20637 L1 and L2 countercells consist of one or more silicon devices.

2.32 Table B shows the maximum and minimum voltage drops.

TABLE B

| LIST NO. | CURRENT FLOW THROUGH CELL | VOLTAGE DROP PER CELL |
|---|---|---|
| 1 | 4 amperes (min.)<br>120 amperes (max.) | 1.7V (min.)<br>2.85V (max.) |
| 2 | 5 amperes (min.)<br>400 amperes (max.) | 1.7V (min.)<br>2.85V (max.) |

2.33 For negative battery plants (positive ground), the load shall be connected to terminal 1 and negative battery to 2 of the countercell. (See Table D).

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2.34 For positive battery plants (negative ground), the load shall be connected to terminal 2 and positive battery to terminal 1 of the countercell. (See Table D).

2.35 For the KS-20637 L1 and L2, warning plates (84022 4018) are to be mounted on front and rear of the battery shelf above the cell stamping. Refer to J-87109y1 drawing.

## 3. KS-15928 SELENIUM - TYPE COUNTERCELLS

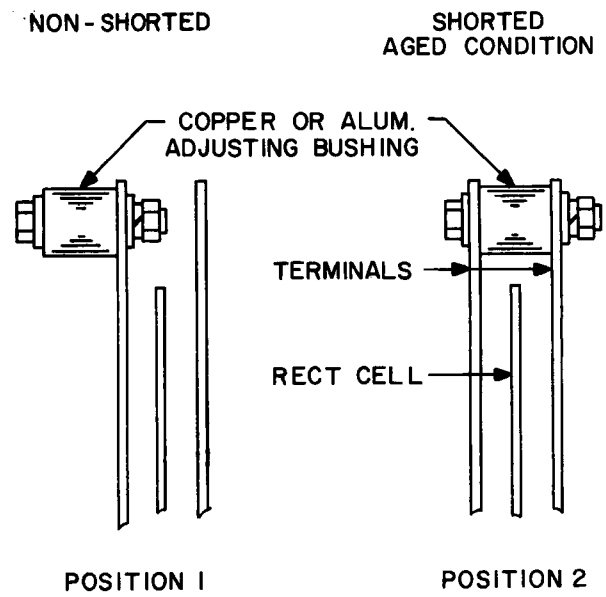
3.1 KS-15928 selenium countercells consist of series and parallel selenium cells to produce about a 2.0 voltage drop.

3.2 Table C shows the minimum and maximum dc currents in the forward direction and voltage drop.

TABLE C

| LIST NO. | MINIMUM | | MAXIMUM | |
|---|---|---|---|---|
| | AMP | VOLT DROP | AMP | VOLT DROP |
| 1 | 1.25 | 1.60 | 12.5 | 2.50 |
| 2 | 2.50 | 1.60 | 25 | 2.50 |
| 3 | 5.00 | 1.60 | 50 | 2.50 |
| 4 | 7.50 | 1.60 | 75 | 2.50 |
| 5 | 10.00 | 1.60 | 100 | 2.50 |
| 6 | 13.00 | 1.60 | 130 | 2.50 |
| 7 | 16.00 | 1.60 | 160 | 2.50 |

3.3 When the voltage increases above the values shown in the Table C due to aging, the drop may be decreased by means of a copper adjusting bushing as shown in Figure 1. This adjustment changes the selenium cell combination from 4-series cells to 3-series cells.




ADJUSTMENT FOR AGING

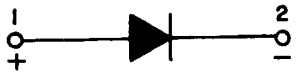
MOVE BUSHING FROM POSITION 1 TO POSITION 2

FIGURE 1

## 4. COUNTERCELL DESIGNATION

4.1 The CEMF cell must be connected according to the polarity of the battery plant in which it is utilized.

4.2 Figures 3 and 4 show typical plant connections for the cells. Table D lists terminal designations for various cells.




ARROWHEAD IS DIRECTION OF LEAST RESISTANCE TO CURRENT FLOW.

FIGURE 2 TYPICAL DIODE

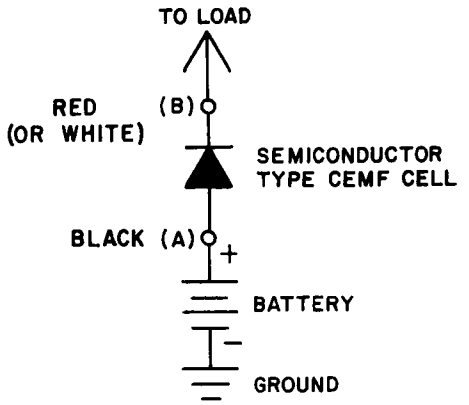



FIGURE 3 TERMINAL CONNECTION FOR POSITIVE BATTERY PLANT

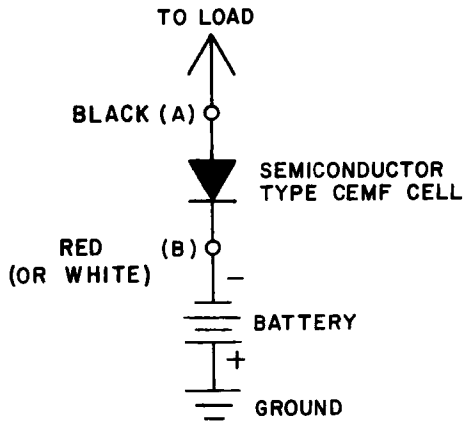



FIGURE 4 TERMINAL CONNECTION FOR NEGATIVE PLANT

| TABLE D | | | |
|---|---|---|---|
| CEMF CELL | FIGURE 3&4 (A) | TERMINAL. DESIG. (B) | NOTE |
| KS-15928 | 1 | 2 | |
| KS-19200 L1 | BLACK | RED | |
| KS-20019 L1 | BLACK | RED | |
| KS-20019 L2 | BLACK | RED or WHITE | 1 |
| KS-20637 L1, L2 | 1 | 2 | |
| | + | − | |

NOTE 1: Voltage drop is reduced by one ninth when the black and white terminals of the cells are used. For MAXIMUM VOLTAGE drop use the black and red terminals.

5. CONNECTING OF COUNTERCELLS

5.1 Contact surfaces on cell posts shall be cleaned and a thin coating of R-3266 NO-OX-ID "A" Compound shall be applied.

5.2 The contact surfaces are generally silver-plated. Cleaning consists of wiping with clean, dry clothes and using small amounts of trichloroethane to aid in removing dirt and grease that cannot be removed with dry cloths.

Manager, Product Engineering

Reason for Reissue:
(1) To replace R-3126 Silicone Compound with R-3266 NO-OX-ID "A" Compound.
(2) To recognize BSP affiliation.
(3) To add information on Warning Plates.

→ Arrowed lines indicate changed or new information